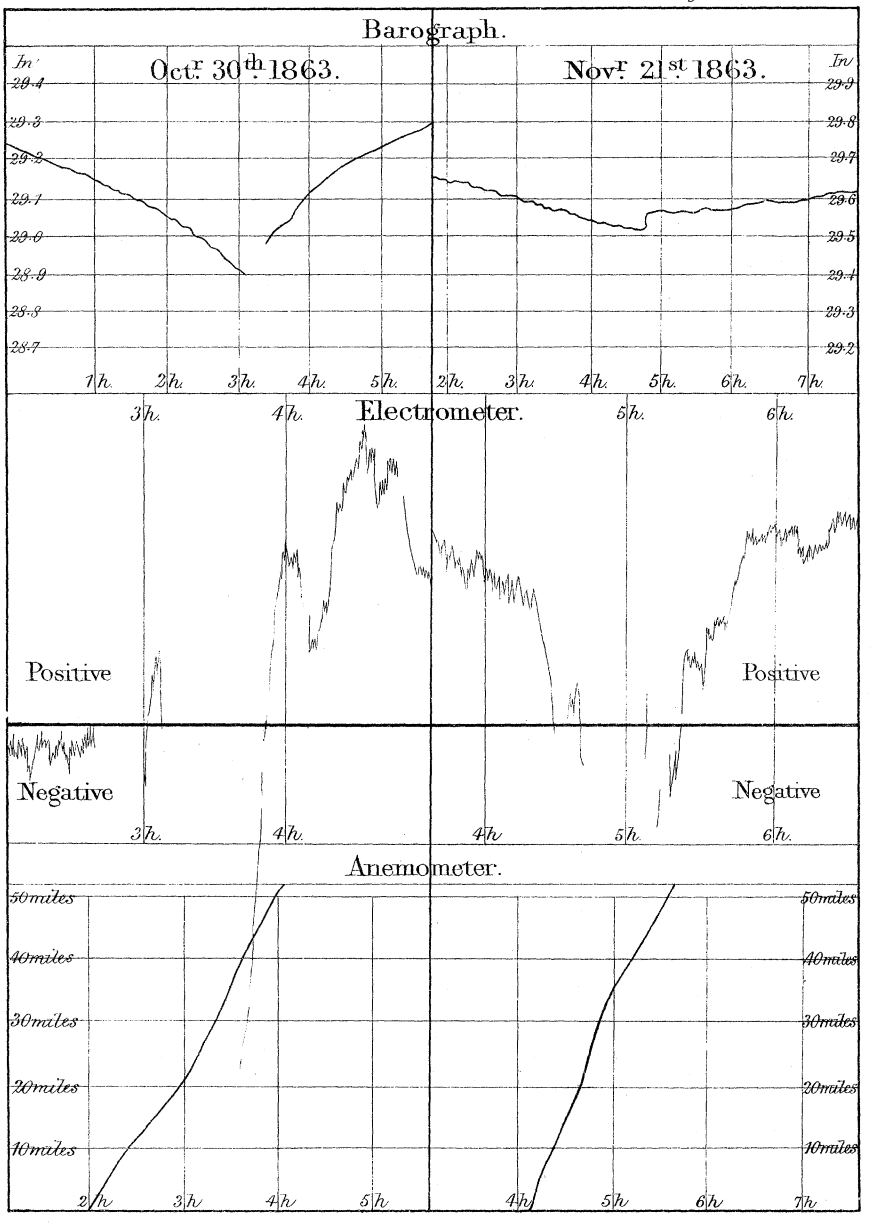

J. Basire lith.

II. "On the Sudden Squalls of 30th October and 21st November 1863." By BALFOUR STEWART, M.A., F.R.S., Superintendent of the Kew Observatory. Received December 10, 1863.

The 30th of October was windy throughout, and in the afternoon there was a very violent squall.

The barograph at the Kew Observatory, as will be seen from Plate I. which accompanies this communication, records a very rapid fall in the pressure of the atmosphere, which appears to have reached its lowest point about $3^h\ 9^m$ P.M., G. M. T. At this moment, from some cause, possibly a very violent gust of wind, the gas-lights in the room which contained the barograph went out, and were again lit in a quarter of an hour. During this interval the barometer had risen considerably; and indeed the barograph curve, although unfortunately incomplete, presents the appearance of an extremely rapid rise. It may therefore perhaps be supposed that there was a very sudden increase of pressure accompanied with a violent gust of wind at the moment when the gas went out, which would be about $3^h\ 9^m$ P.M., as above stated.

In a paper communicated to the Royal Society on November 23, Mr. Glaisher has remarked that at Greenwich the time of maximum depression of the barometer was $3^h\ 30^m$ P.M., while at the Radcliffe Observatory, Oxford, it was $2^h\ 30^m$ P.M. This would indicate a progress of the storm from west to east, in accordance with which Kew should be somewhat before Greenwich as regards the time of maximum depression. This anticipation is therefore confirmed by the record of the Kew barograph which has been given above.

The indications of the Kew self-recording electrometer during this squall show that about $2^h\ 39^m$ P.M. the electricity of the air, which before that time had been very slightly negative, became rapidly positive, then quickly crossed to negative, became positive again, and once more crossed to negative about $3^h\ 3^m$ P.M., recrossing again from strong negative about $3^h\ 51^m$ P.M., after which it settled down into somewhat strong positive.

It is well, however, to state (what may also be seen from Plate I.) that the variations of this instrument between $3^h\ 3^m$ P.M. and $3^h\ 51^m$ P.M. were so rapid as not to be well impressed upon the paper.

At Kew there is often occasion to move the dome, so that we cannot well have an instrument which records continuously the direction of the wind; but we have a Robinson's anemometer, which records the space traversed by the wind, and thus enables us to find its velocity from hour to hour, though not perhaps from moment to moment. A reference to Plate I. will show an increase in the average velocity of the wind during this squall.

A somewhat similar squall took place in the afternoon of Saturday, November 21st, about 4 o'clock.

In this case the Kew barograph presents a *rapid* (and, in the curve,

ragged) fall of the atmospheric pressure, which reached its minimum about $4^h\ 45^m$ P.M. There was then a very abrupt and nearly perpendicular rise of about five hundredths of an inch of pressure, or rather less, after which the rise still went on, but only more gradually.

Through the kindness of the Rev. R. Main, of the Radcliffe Observatory, I have been favoured with a copy of the trace afforded by the Oxford barograph during this squall, in which there appears a very sudden rise of nearly the same extent as that at Kew, but which took place about four o'clock, and therefore, as on the previous occasion, somewhat sooner than at Kew. This change of pressure at Oxford was accompanied by a very rapid fall of temperature of about 8° Fahr.

The minimum atmospheric pressure at Kew was 29·52 inches, while at Oxford it was 29·28 inches.

It will be seen from the Plate that at Kew the electricity of the air fell rapidly from positive to negative about $4^h\ 30^m$ P.M., and afterwards fluctuated a good deal, remaining, however, generally negative until $5^h\ 22^m$ P.M., when it rose rapidly to positive.

We see also from the Plate that there was an increase in the average velocity of the wind at Kew during the continuance of this squall. To conclude, it would appear that in these two squalls there was in both cases an exceedingly rapid rise of the barometer from its minimum both at Oxford and at Kew, this taking place somewhat sooner at the former place than at the latter; and that in both cases the air at Kew remained negatively electrified during the continuance of the squall, while the average velocity of the wind was also somewhat increased.

The Society then adjourned over the Christmas recess to Thursday January 7, 1864.

"On the Equations of Rotation of a Solid Body about a Fixed Point." By WILLIAM SPOTTISWOODE, M.A., F.R.S., &c. Received March 21, 1863.*

In treating the equations of rotation of a solid body about a fixed point, it is usual to employ the principal axes of the body as the moving system of coordinates. Cases, however, occur in which it is advisable to employ other systems; and the object of the present paper is to develope the fundamental formulæ of transformation and integration for any system. Adopting the usual notation in all respects, excepting a change of sign in the quantities F, G, H, which will facilitate transformations hereafter to be made, let

$$A=\Sigma m(y^2+z^2), \quad B=\Sigma m(z^2+x^2), \quad C=\Sigma m(x^2+y^2),$$
$$-F=\Sigma myz, \quad -G=\Sigma mzx, \quad -H=\Sigma mxy;$$

* Read April 16, 1863: see abstract, vol. xii. p. 523.